

CAMPBOR CULTIVATION IN THE UNITED STATES.

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INTRODUCTION.

The camphor tree seems to be native in the coastal regions of southeastern Asia, both on the mainland and in the southern part of the Empire of Japan. It is but natural, therefore, that the earliest records of the plant should occur in Chinese literature. In the sixth century A. D.¹ the tree was referred to as a valuable timber, no reference being made, however, to the gum. It is somewhat strange that a search of the older Chinese literature should have failed to develop any earlier references to either the tree or its rather striking product.

The name has been traced to various possible sources, among others to the Sanscrit "karpura," meaning white. The early literature of India, as well as the Greek and Roman classics, contains no references to camphor. It seems to have been well known to the Arabians, the gum having been first mentioned early in the sixth century A. D. It appears under the name of "caphura" in a medical prescription written at about this time by Actios, in Mesopotamia. During the ascendancy of the Arabians in the Mediterranean region, camphor seems to have become a well-known product enumerated among articles possessed by princes and other persons of great wealth. The refining of camphor seems to have originated with the Venetians, and was long thereafter carried on in Holland as a secret process. In time, however, information on the subject seems to have become more widely diffused, and with the return of travelers camphor trees were brought to the Occident. Camphor has long enjoyed a prominent place in medicine, but it was not until its usefulness in the making of various technical products was demonstrated that commerce in camphor reached great importance.

Within the last fifty years there has been a greatly increased demand for this product in the manufacture of celluloid and other nitro-cellulose products. It enters into the manufacture of many pharmaceutical preparations, and from it are made various antiseptic com-

¹ See Flückiger, F. A., *Pharmakognosie des Pflanzenreiches*, 3d ed., Berlin, 1891, p. 159.

pounds. It is also used as an insecticide. There are probably few plant products which find so many and such varied uses as camphor.

The following table shows the quantity and value of the importations of camphor during the past ten years:

Importations of camphor into the United States, for consumption, from 1899 to 1909, inclusive.¹

Year ending June 30—	Quantity.		Total value.		Value per pound.	
	Crude.	Refined.	Crude.	Refined.	Crude.	Refined.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Dollars.</i>	<i>Dollars.</i>	<i>Cents.</i>	<i>Cents.</i>
1899.....	1,807,542	90,743	322,100	28,806	17.8	31.7
1900.....	1,789,580	109,971	485,071	42,901	27.1	39.0
1901.....	2,175,874	77,313	738,875	39,507	34.0	51.1
1902.....	1,831,058	186,882	576,405	61,592	31.5	33.0
1903.....	2,508,420	43,096	764,403	19,399	30.5	44.4
1904.....	2,819,883	152,558	874,709	64,234	31.0	42.1
1905.....	1,924,077	214,050	638,765	117,277	33.2	54.8
1906.....	1,668,799	338,458	608,463	207,813	36.5	61.4
1907.....	3,138,397	463,977	1,572,881	373,137	50.1	80.6
1908.....	2,811,358	519,890	1,365,287	322,755	48.5	62.1
1909.....	1,990,499	430,564	602,530	151,990	30.3	35.3

¹ From annual reports of Foreign Commerce and Navigation of the United States, published by the Department of Commerce and Labor.

The greater part of the world's supply of camphor comes from Formosa, but there is a relatively small production in Japan. The Japanese camphor monopoly controls the entire output of Japan and Formosa and is said also to handle a considerable portion of that produced in China. The output of the monopoly for the year ended March 10, 1910,* was about 8,000,000 pounds of camphor and camphor oil.

Within recent years there has been a revival of the industry in the Chinese province of Fukien, and during the year 1909 there were shipped from that province to Foochow about 1,064,000 pounds of camphor and 2,660,000 pounds of the oil. In both China and Formosa camphor is made from the native forest trees and until recently there had been no serious movement toward replanting. The camphor forests are thus becoming exhausted, and if the cultivation of this tree is not begun we must inevitably face a shortage of camphor with consequent high prices.

PRESENT METHODS OF MANUFACTURE.

Until recent years no attempt has been made in either China or Formosa to improve the methods of camphor manufacture. The usual apparatus consists of a shallow iron kettle supported over a stove made of stones and clay, the kettle being fitted with a perforated

wooden cover, over which is placed a bottomless wooden tub with a removable cover. A bamboo tube leads from the tub to a series of wooden boxes, over which water is run for cooling purposes. These boxes, which serve as the condenser, are sometimes filled with bundles of rice straw to facilitate cooling.

The apparatus is set up, if possible, by the side of a small stream near the trees to be worked up. The trees are felled, the trunks, roots, and large branches cut into small chips, and the tub filled with this material. Steam is generated in the kettle and passes through the cover into the tub filled with the chips. The camphor is taken up by the steam which passes through the bamboo tube, and is cooled and condensed in the boxes, where it is deposited in a solid mass. From time to time various minor changes have been made in the apparatus. At present, in some parts of Formosa an inverted sirup evaporator is used as a condenser in place of the boxes.

This apparatus seems crude, but it has the advantage of being portable and can be carried farther and farther into the forest as the trees become exhausted. Furthermore, the work is carried on in those forests where the workers are exposed to the raids of the "head-hunters," and many stills are destroyed annually by these tribes. In Japan some progress has been made in devising improved apparatus, but the new condensers have not yet come into general use.

CULTIVATION OF CAMPHOR IN THE UNITED STATES AS AN ORNAMENTAL.

When the camphor tree was first introduced into this country is not clear. There are several trees in Florida which were brought in as seedlings between 1870 and 1875, and from their seed have been grown many of the camphor trees of that State. About 1880 the Department of Agriculture distributed seed and young trees, and these also have yielded stock for nursery purposes.

During the past 10 years camphor trees have been very extensively planted for ornamentals and windbreaks in the Southern and South-western States and in some places nearly every home has one or more camphor trees in its yard. One Florida nursery alone sells annually about 15,000 trees.

Although the introduction of the camphor tree was undertaken in the earlier days chiefly because of the value of this plant as a shade tree, the idea of its eventually proving useful for the production of camphor was not altogether overlooked. Mr. William Saunders, in the report of the Department of Agriculture for 1889, says "they answer a good purpose as ornamental shade trees, with a probability that when they become more plentiful and better known efforts may be made to extract camphor from the branches." Such efforts seem, however, to have been rather long delayed. In the summer of 1904,

as a part of the work of the then newly established laboratory of drug-plant investigations, Mr. W. O. Richtmann was sent into the field to investigate the camphor content of the trees previously introduced. Camphor material was distilled in Florida, Texas, California, and others of the warmer States. Encouraged by the favorable results obtained, the Department made arrangements to secure the use of land at Huntington, Fla., to be chiefly devoted to camphor work. This work took on an unusual interest shortly after it was undertaken on account of the high price to which Japanese camphor rose, supposedly because of the speculative operations in Japan and elsewhere. The wholesale market price of American refined camphor during the eight years from 1902 to 1909, as presented in the following table, shows strikingly the effect of powerful disturbing influences.

Price per pound of American refined camphor, 1902 to 1909, inclusive.

[From volumes of the Oil, Paint, and Drug Reporter, New York.]

Years.	Highest price.	Lowest price.	Years.	Highest price.	Lowest price.
	<i>Cents.</i>	<i>Cents.</i>		<i>Cents.</i>	<i>Cents.</i>
1902.....	57	54.5	1906.....	117	88
1903.....	58.5	54.5	1907.....	124	68
1904.....	93	58.5	1908.....	68	50
1905.....	88	68	1909.....	50	45

These preliminary experiments seemed to show that camphor gum and camphor oil are produced under American conditions in quantities sufficient to justify further work. Shortly after the preliminary plantings had been made at Huntington, the experiment was removed to Orange City, Fla., in order to obtain somewhat better facilities. The results summarized in this paper were almost wholly worked out after the removal to the latter point.

METHODS OF CULTIVATION.

The camphor tree is hardy where the winter temperature does not fall below 15° F., but even at this temperature some loss of small branches will occur if the tree continues to grow until late in the season and has not become completely dormant before the frost comes. The tree easily adapts itself to new conditions, and can be grown on a wide range of soils; in fact, it can be grown on any soils except on very low land where water stands part of the year. The maximum growth occurs, however, on a rich, well-drained soil (Pl. XLVI, fig. 1).

For commercial cultivation it is probably best to plant on low-priced sandy land, since in this situation the trees do well with less cost for cultivation and a smaller initial cost of land.



FIG. 1.—CAMPHOR TREE ABOUT 16 YEARS OLD. GROWN IN FLORIDA.

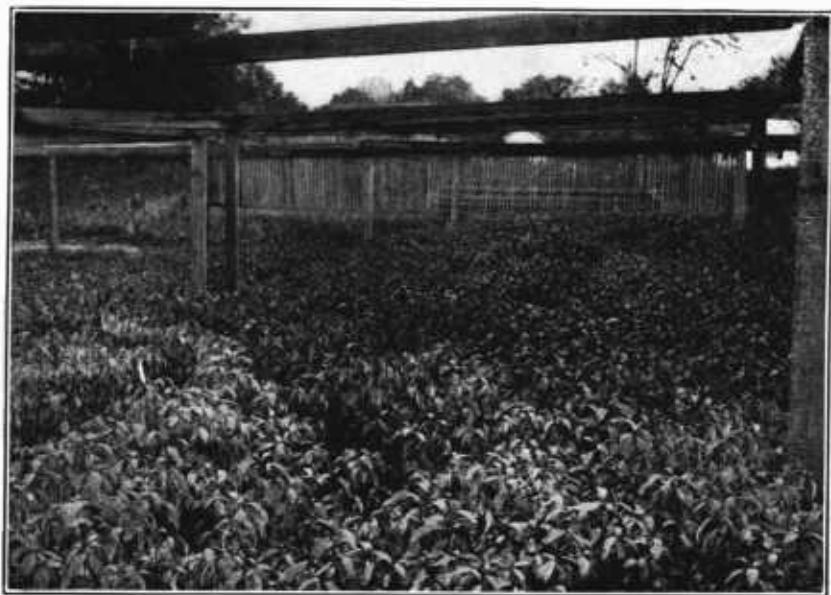


FIG. 2.—COVERED CAMPHOR SEED BED WITH THE COVER REMOVED TO HARDEN OFF THE PLANTS.

PROPAGATION.

Camphor can be propagated by seed, cuttings, and root cuttings, but for commercial purposes the first method is to be preferred, except in cases of special varieties having some valuable characteristic which would not be reproduced by the seed. In propagation by seed great care should be taken in the selection of the land for the seed bed (Pl. XLVI, fig. 2). If possible, a rich, well-drained soil which has been under cultivation in previous years should be found. If this is not possible, new land can be used; but in either case land infested with Bermuda grass or maiden cane can not be used, since the roots of these grasses will take up the moisture in the soil and prevent the germination of the seed.

THE SEED AND SEED BED.

The land should be plowed about September 1 and well cut up with the disk harrow. About October 15 it should again be worked and all dry roots and trash removed. Too much emphasis can not be placed on the preparation of the seed bed, since after the seeds are planted no cultivation can be given for three months.

In size and shape, camphor seed resembles the common wild black cherry, consisting of a small stone surrounded by a fleshy pulp covered with a thin black skin. When the seeds are ripe, about October 15, they are of a dull-black color and are then ready to be gathered.

The seed bed should be prepared before the seed are gathered, and as soon as secured the berries should be planted fresh with the pulp left on. For convenience in future handling, the seed should be planted in hills $3\frac{1}{2}$ feet by $1\frac{1}{2}$ feet, with three seeds to the hill, and covered about 2 inches deep. This method will require about 24 quarts of seed per acre and will produce enough trees for setting 16 acres of field planting.

CULTIVATION.

The seeds will begin to come up about three months after planting, but four or five months are often required for a full stand. The percentage of germination is very low and only about one-half the seeds may be expected to grow. Cultivation should begin as soon as possible, and as soon as a full stand is obtained the plants should be thinned to one in a hill and given a good dressing of high-grade fertilizer.

The first season the plants should make a growth of 12 to 18 inches, with a very large and vigorous root system. The treatment the second year should be the same, and at 26 months from planting the plants should be from 2 to 3 feet high and well branched. At this time they are ready for field setting.

GROWTH.

The root system of a 2-year-old camphor tree (Pl. XLVII, figs. 1 and 2) consists of a taproot 1 inch in diameter at the top and about 3 to 5 feet long. Up to this time the laterals are represented mainly by small fibers on the taproot. In transplanting under commercial conditions these fibers are killed and are not renewed as quickly as in some other trees. The tree must be set early in the fall in order that the root system may be well established before the hot weather of the spring comes on. Experiments have shown that setting in December gives the best results.

PREPARATION OF LAND FOR PLANTING.

The land should be well prepared by deep plowing early in the fall and again worked just before the trees are set. It is desirable to lay off the rows in checks 6 by 15 feet, since this will facilitate later cultivation. The trees can be dug with a tree digger and should be cut back very severely. All leaves and small twigs should be removed (Pl. XLVII, figs. 3 and 4) and the tree well headed back. The taproot should be cut back to 12 inches and all the small laterals removed.

The trees should be set at the same depth they were in the seed bed, and a small basin formed by the soil about them for the reception of water. One application of water should be given when the trees are set and one or two later on, as needed, if the rainfall is scanty. No growth will take place in the roots if dry soil is allowed to remain in contact with them, but too much water will cause the roots to sour and die. In those parts of the South where there is a definite rainy season good results can be secured by setting the trees about July 1, no watering being needed except a small application at the time the trees are set. By this method the trees have a tendency to continue growth until late in the fall or early winter, and are exposed to danger of frost, since they are very tender when in a growing condition. In frost-free localities, however, this method can be followed with less expense. Plate XLVIII, figure 1, shows such a young camphor nursery well established.

FERTILIZING AND CULTIVATING.

The question of fertilizer for the trees after they are in the field has not yet been worked out. Experiments have shown that the trees respond very readily to fertilizer, but whether the additional growth will pay for the material used has yet to be determined. It is fairly certain, however, that it will pay to apply about 2 pounds per tree for the first two years, until they get well started.

Cultivation should be thorough and frequent, and, where it can be done, small crops, such as cotton, peas, and corn, should be grown

between the rows for two or three years. If, however, a tall-growing crop, such as corn, is used, care should be taken not to plant too near the trees, since even slight shade retards growth.

At five or six years from the seed the trees should be 7 to 8 feet high and very bushy. At this time the trees should be trimmed to shape them up into hedges and the first harvest should be secured.

HARVESTING.

Up to the present time nearly all camphor is made from the wood of old forest trees and but little use has been made of the leaves and branches. This is partly due to the fact that in the camphor countries the camphor is localized mostly in the old wood, while that in the leaves contains a large percentage of oil. In the Southern States the camphor yield of the leaves is high and there is little in the wood before it reaches an age of 10 years or more. To grow the tree for the wood means long waiting for returns and the ultimate destruction of the tree.

Experiments have shown that the tree can be handled in hedges and kept trimmed back to a height convenient for working. In fact, camphor is often used as a hedge tree in the South and responds to trimming more readily than almost any other tree or shrub. This adaptability for hedges can be taken advantage of for commercial purposes, repeated experiments having shown that the camphor yield can be greatly increased in the leaves by trimming.

On the Department's experimental plats the trees are planted in rows 15 feet apart and 6 feet apart in the row. They are grown to an A-shaped hedge 8 feet high and 8 feet wide at the base. By this method they are kept back to a convenient size for working and are not dwarfed sufficiently to injure the vigor of the tree. At six years from the seed the trees will form a solid hedge in each row and will be thick and bushy to the ground.

Camphor is represented in the growing tissue by oil, which as the leaves mature is changed into camphor. Distillations made at different times during the growing season show a rapid gain in camphor content as the leaves approach maturity; also that it is highest during the dormant period.

In most places in the South the tree has two growing seasons and two dormant periods. Growth begins in February and before May 1 a leafy growth of 6 to 10 inches has formed. On this growth are formed the flowers and seed. From May 1 to June 15 the weather is hot and dry and the tree goes into a dormant period. With the coming of the summer rains growth begins again and continues until about the middle of September, when the winter dormant period begins.

CAMPHOR CONTENT OF LEAVES AND TWIGS.

After the spring growth begins, there occurs the fall of the leaves 12 and 18 months old. Under normal conditions all leaves remain on the tree one full year. Distillations made from leaves of different ages showed a slight decrease in camphor content after maturity is reached, but a large proportion of the camphor remains in the leaf until it falls. Distillations from dead leaves fallen from the tree gave a yield of 2 per cent of oil and camphor. The loss of camphor in the leaf as it matures and dies is greater, however, than the percentages show, since there is also a loss of water and a consequent decrease in the weight of the material.

With the twigs the difference is still greater. At the close of the growing season the twigs were found to contain as high a percentage of camphor as the leaves on them, but the yield from older twigs was very low. This is due to the fact that in the twigs the camphor is in the bark and almost none is localized in the new wood.

These experiments show that if the hedges are trimmed at the end of each growing season a maximum quantity of camphor is obtained with a minimum of useless material to handle. The hedges can be trimmed by machinery, so that the cost of harvesting will be small, and with some minor changes some types of machines now in use can be utilized. The Department of Agriculture is working on this problem, but as yet the tests are incomplete. After cutting, the trimmings should be taken to the distilling plant at once, since if they are allowed to dry in the sun or remain exposed to the dew and rain there is some loss of camphor.

DISTILLATION METHODS.

Camphor is obtained in the same manner as other volatile-oil products; that is, by steam distillation. When steam is passed through a suitable receptacle filled with the leaves the camphor is extracted in the form of a vapor and passes off with the steam. If the camphor-containing steam is conducted into a condenser, the steam is condensed to water and the camphor is deposited as a solid or semisolid mass floating on the water or deposited on the inside of the apparatus. The volatile oil remains as a pale liquid floating on the water.

When brought from the field, the trimmings should be elevated to the top of the building, where they can be stored in bins until wanted for the retort. They should not be allowed to remain more than a day or two, however, since if piled in large heaps sweating will occur and some of the camphor will be lost. As needed, this material can be delivered to the retort through chutes with a minimum of time and labor.



FIG. 1.—CAMPHOR SEEDLING FROM COVERED SEED BED BEFORE CUTTING BACK FOR SETTING IN DECEMBER.



FIG. 3.—CAMPHOR SEEDLING FROM COVERED SEED BED CUT BACK FOR SETTING IN DECEMBER.

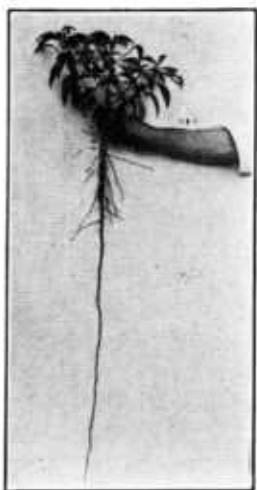


FIG. 2.—CAMPHOR SEEDLING FROM OPEN SEED BED IN DECEMBER.

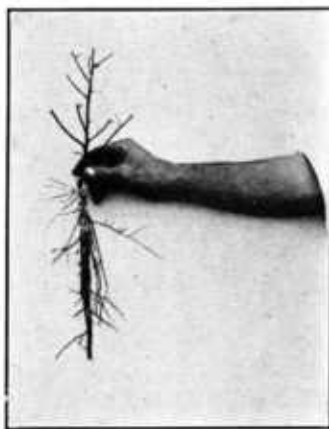


FIG. 4.—CAMPHOR SEEDLING FROM OPEN SEED BED CUT BACK FOR SETTING IN DECEMBER.

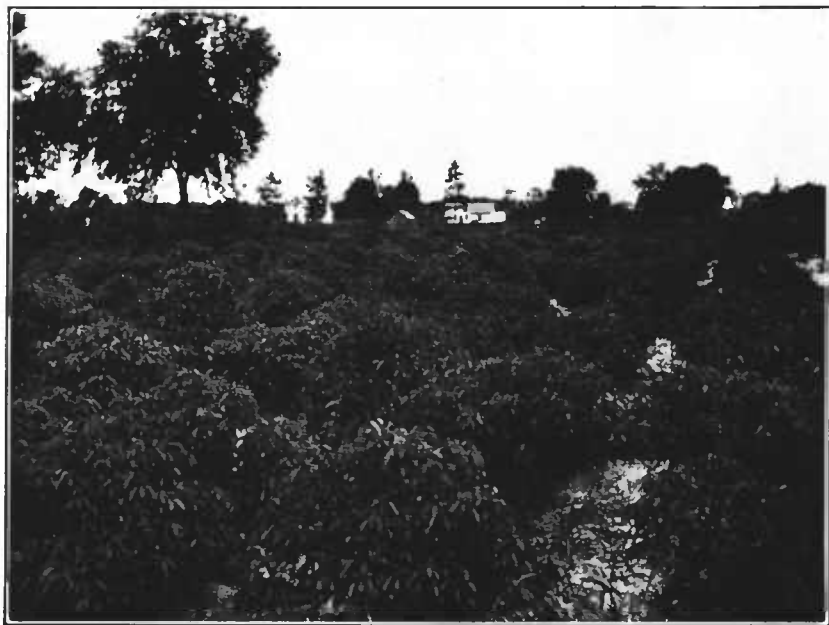


FIG. 1.—CAMPBOR NURSERY SET IN THE SPRING OF 1908.

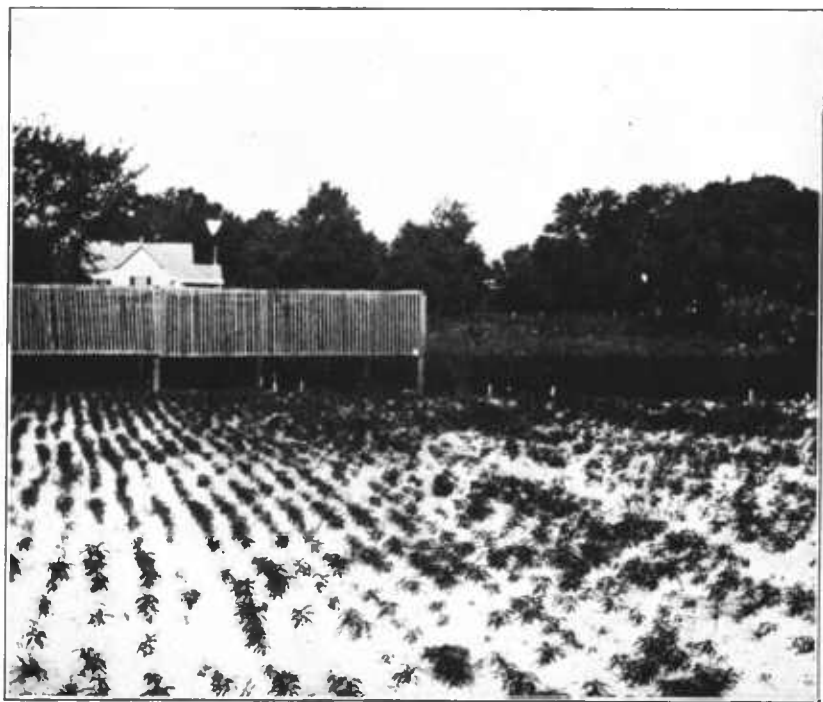


FIG. 2.—CAMPBOR SEEDLINGS IN UNPROTECTED SEED BED.

Any of the standard types of retort employed for other volatile oils can be used for camphor. The most common one is a circular wooden vat about 6 feet in diameter and 8 to 10 feet deep. This is fitted with a removable cover, which can be made steam tight. The retort is fitted with a perforated false bottom, and to its edges are attached four chains reaching to the top of the retort. Steam is admitted to the bottom through a pipe from a boiler. The retort is closely packed with the trimmings, the cover fastened down, and the connections with the condenser made. Steam should be admitted under pressure, but no pressure should be developed in the retort. To prevent this the outlet pipe should be twice the size of the inlet pipe. The time required for distillation depends on the size of the charge, the closeness of the packing, and the amount of steam used. When exhausted the charge can be hauled out by means of tackle attached to the chains and the material carried on a track to the dump heap.

This type of retort gives good results with camphor trimmings, except that some difficulty is experienced when the charge is drawn out. This material, consisting of leaves and short twigs, does not hang together well and the charge is likely to fall to pieces before it can be gotten to its destination. If rods are used in place of chains, and to them is fastened a fine-meshed wire netting fitting closely to the sides of the retort, this difficulty is done away with. With this device, however, the material can not be packed closely to the sides of the retort and uneven steaming is the result.

When metal retorts are used they are attacked by the camphor vapors and a deposit of oxids and sulphids of the metal is carried over with the camphor. This causes a black impurity in the camphor which injures its appearance, but as all crude camphor must be refined before using this impurity is later removed. It is almost impossible to avoid some of this impurity, since metal must enter into the construction of some parts of the apparatus.

METAL RETORTS.

If a metal retort is to be used, it should be made of boiler iron three-sixteenths of an inch thick and cylindrical in shape. A capacity of 200 cubic feet will contain a ton of trimmings if closely packed. The cover of the retort should be slightly conical in shape, with the outlet pipe in the center. It should be riveted to a flange fitting a similar flange on the body of the retort, so that the joint can be made steam-tight by means of a packing ring. The fastenings should be swinging eyebolts attached under the lower flange and let into both flanges by slots. The bottom of the retort should be of the same construction as the top, but should be nearly flat and hung to the retort by a heavy hinge on one side. The fastenings should be of the same sort as those used in the cover. The swinging bottom should

be fitted with a false bottom of heavy wire netting of about 1-inch mesh, and supported on pillars raising it 4 inches from the inside of the bottom. The steam inlet should be by two pipes on opposite sides entering the chamber formed between the true and false bottoms. In this manner an even distribution of steam is secured over the bottom of the charge. The retort should be raised several feet from the ground, so that when the charge is exhausted the bottom can be swung back and the charge allowed to fall out into a car, which can convey it on a track to the dump heap.

This type of retort is much more expensive than the wooden one, yet the greater durability and convenience will more than compensate for the extra cost. A type similar to this is used for the distillation of pine chips, but this type is constricted at the top and bottom and the swinging bottom is of much smaller diameter than the body. This can not be used for camphor, since the charge will strike the shoulder at the bottom and have to be removed by hand.

The time required for distillation depends on the size of the charge and the amount of steam used. A ton charge can be completely exhausted in from two to three hours with a moderate amount of steam.

THE PROBLEM OF THE CONDENSER.

The problem of securing a condenser for camphor has been a difficult one. It is out of the question to use wooden boxes or inverted sirup evaporators, as in China and Formosa, and none of the types of condensers used for oils can be used, since the condensed product is a solid and deposits on the inside, completely filling it. Tubular and coil condensers are also out of the question. Several condensers of an entirely new type have been devised and comparative tests are being made with them. One has been secured which so far has given excellent results, but the tests are not yet completed. In the near future the Department of Agriculture hopes to have this problem worked out and to be able to recommend a condenser which will meet all the requirements of commercial work.

REFINING.

As received from the condenser, the camphor is in a very impure state. It is a semisolid mass of a brownish color and about the consistency of melting snow. This crude camphor contains about 75 to 80 per cent of pure gum camphor and about 15 to 20 per cent of camphor oil, the remainder consisting of oxids and sulphids of iron, water, and other foreign matter. This crude product must be refined before it can be placed on the market.

The first step in this process is to remove the oil. This is done by throwing the mass into a centrifuge giving a centrifugal force of 550 to 600 gravities. By means of this machine nearly all the oil can be

removed, and washing with warm water while still in the centrifuge will remove almost the last trace. The camphor thus secured is dry, but still has a brownish color, due to the metallic impurities. By the regular process of sublimation in iron kettles, the camphor can be secured in either the transparent slabs or "flowers of camphor," as is desired.

The oil secured from the centrifuge is of a brownish color and is one of the most complex of volatile oils. It contains several constituents which find ready sale in the trade, but chief among them is the camphor which is dissolved in it to the extent of about 30 to 35 per cent. By fractional distillation and subsequent freezing of the camphor-containing fractions, this camphor can be secured and added to that first obtained.

The camphor oil secured from the wood in China and Japan contains a high percentage of safrol, and the fraction containing this is used in the trade in artificial oil of sassafras. Oil secured from the wood of Florida-grown trees contains good percentages of safrol, but little or none is found in the oil from the leaves.

YIELD.

Distillations made from more than 1,000 trees in Florida, Texas, Alabama, Louisiana, and California show that there is a very wide range in the camphor yield of the leaves and twigs. Some samples from trees which had been shaded by buildings or by other trees have given as low as 0.70 per cent of camphor and oil together. Other trees which have been retarded in growth by being planted on very poor land and given no care have given as high as 2.77 per cent of camphor distillate. These, however, are extremes, the usual yield being from 1.75 to 2.25 per cent. All these percentages are based on the green weight of the material and are given in the percentage of crude camphor distillate secured. The amount of pure gum camphor in the crude product shows but slight variations and usually falls between 75 and 80 per cent. The usual yield of pure gum camphor from leaves and twigs of single trees is from 1.35 to 1.50 per cent, calculated on the green weight of the material. It has been shown, however, that the yield is increased by trimming, and a larger yield can be secured from hedges.

As yet the hedges planted by the Department of Agriculture have not reached sufficient size for trimming, and it has not been possible to secure a satisfactory estimate of the yield per acre to be obtained. A number of tests have been made on ornamental hedges of various sizes and ages, but the material has been too limited to furnish definite data on the yield of hedges planted on a large scale. It is thought safe in estimating, however, that hedges planted 15 feet apart with the plants 6 feet apart in the row, grown 8 feet high, will give 8,000 pounds per acre of trimmings for each of two cuttings, making a total

of 8 tons per acre each year. This will give from 175 to 200 pounds per acre of marketable camphor. The trimmings of measured areas on ornamental hedges have far exceeded this, but it is well to avoid using the yield of a few square yards in estimating the yield per acre.

FROST.

In those parts of the South where valuable fruit groves have frequently been lost by sudden frosts, the first question raised is, "What will frost do to a camphor plantation?" If the temperature falls below 15° F. or occurs when the trees are in a growing condition, the smaller branches will be killed. During the freeze of 1895 in Florida many trees were killed to the ground, but this was due to the fact that the freeze came when the trees were in a growing condition. In December, 1909, there were in the nurseries of the Department of Agriculture at Orange City, Fla., 30,000 trees 1 and 2 years old. These withstood a temperature of 16° F. for three consecutive nights and suffered but slight injury. If, however, a plantation of camphor hedges should be killed to the ground they will renew themselves from the roots in one year. Experiments have been made in cutting down trees 6 to 10 years old, and in all cases they have made a growth of 6 to 10 feet the first year. The deadwood from frozen trees contains sufficient camphor to pay for working up, and the killing of trees to the ground would not even necessitate the shutting down of the distilling plant.

FUTURE OUTLOOK.

In many parts of the South, especially in Florida, there are large areas of light sandy land not well suited to general farming. This land can be secured at a low price and there is every indication that camphor growing on this land can be made a commercial success. The demand for the product is steady and if it could be supplied from a source less liable to price fluctuations than at present it is probable that larger quantities of it would be used in the arts.

At the present time it is not advisable to plant camphor in small areas with the hope of securing a profitable income by selling the trimmings to a near-by distilling plant. It is a question as to how far it will pay to transport this material, and a planter might be left with a worthless overgrown plantation on his hands if a distilling plant should not be in operation in his vicinity by the time his trees were ready for trimming. Until the industry becomes well established planting should be on a sufficiently large scale to warrant the building of a distilling and refining plant in connection with it, and for this purpose 200 acres may be considered a minimum area. The cost of production per pound will be less if made on a much larger scale. It appears probable that an area of 500 acres will warrant the installing of sufficient machinery to produce camphor at a minimum cost.